REMARKS

Favorable reconsideration and allowance of the claims of the present application are respectfully requested.

Before addressing the specific grounds of rejection raised in the present Office Action, applicants have amended Claim 1 by inserting the term "and" between components d) and e).

Applicants submit the above amendment to Claim 1 does not introduce any new matter into the specification of the instant application. Thus, entry of the above amendment is respectfully requested.

In the present Office Action, Claims 1-12 stand rejected under 35 U.S.C. § 103 as allegedly unpatentable over the combined disclosures of U.S. Patent No. 4,168,223 to Igarashi, et al. ("Igarashi, et al."), U.S. Patent No. 5,951,841 to Wehlage, et al. ("Wehlage, et al.") and U.S. Patent No. 6,183,545 to Okuhama, et al. ("Okuhama, et al."). Claims 13 and 14 stand rejected under 35 U.S.C. § 103 as allegedly unpatentable over the combined disclosures of Igarashi, et al., Wehlage, et al., Okuhama, et al. and U.S. Patent No. 5,409,592 to Meyer, et al.

Applicants respectfully submit that the combination of applied references does not teach or suggest applicants' claimed aqueous solution for electroplating tin-zinc alloys in which components a)-e) are each employed. In accordance with the present application, a tin-zinc electroplating bath solution that permits deposition of Sn-Zn alloys that is free of faults and discoloration is provided. See Page 1, last paragraph to Page 2, first paragraph. Specifically, applicants have determined that by utilizing a tin-zinc

electroplating bath that includes both non-ionic and anionic surfactants the deposited Sn-Zn alloy will be free of faults and discoloration. None of the applied references discloses a relationship between the combined use of a non-ionic surfactant and an anionic surfactant and the formation of a Sn-Zn alloy deposit that is free of faults and discoloration.

To demonstrate the importance of using both non-ionic and anionic surfactants in Sn-Zn alloy electroplating baths, applicants refer to the comparative experiments that were provided in the PCT International Preliminary Examination Report and applicants' representatives letter dated February 6, 2001. Applicants note that these two items were previously submitted to the USPTO in the Information Disclosure Statement dated August 31, 2001. Despite this previous submission, applicants have enclosed copies of the PCT International Preliminary Examination Report and applicants' letter dated February 6, 2001 herein.

The comparative experiments submitted during the International Preliminary Examination proceedings show that a Sn-Zn electroplating bath containing a non-ionic surfactant together with an anionic surfactant resulted in significantly improved depositions compared to an electroplating bath containing no surfactants at all, exclusively non-ionic surfactants or exclusively anionic surfactants. This data is shown in Comparative Tests 1-4.

In particular, the data previous provided shows that an electroplating bath containing neither non-ionic nor anionic surfactants (See Test 1) gave a dark-gray irregular dendritic and non-adhesive coating. The deposition obtained by using an electroplating bath containing additionally an anionic surfactant (See Test 2) was dark-

gray and coarse crystalline having dendrites in the high current range were obtained. A plating bath wherein the anionic surfactant was replaced with a non-ionic surfactant (See Test 3), gave a fine crystalline, but dark-gray and irregular coating. However, the plating result obtained by using the inventive electroplating bath that contained both anionic and non-ionic surfactants (see Test 4) was regular, fine, crystalline, satin finished coating over the entire current density range. This unexpected effect cannot be deduced from any of the applied references cited in the present Office Action.

Applicants submit that the disclosure of Igarashi, et al. is defective because the applied reference does not teach or suggest a tin-zinc electroplating bath that contains both anionic and non-ionic surfactants, as presently claimed. Igarashi, et al. provide an electroplating bath for depositing tin or tin alloys that includes all the claimed components except for anionic surfactants. This omission of anionic surfactants from the Igarashi, et al. disclosed plating bath is acknowledged by the Examiner at Page 3, lines 10-12 of the present Office Action.

Despite this omission from the disclosure of Igarashi, et al., it is the Examiner's opinion that it would have been obvious to utilize both non-ionic and anionic surfactants in the electroplating bath of Igarashi, et al. because non-ionic and anionic surfactants are known to be useful constituents in plating baths and that the disclosures of Wehlage, et al. and Okuhama, et al. suggest the use of more than one type of surfactant. Applicants respectfully disagree with the foregoing and submit the following comments:

Tin salts and zinc salts are mentioned as preferred metals salts in Wehlage, et al. However, exemplified alloys only include zinc-cobalt, zinc-nickel, and zinc-iron alloys.

See Col. 6, lines 63-64. Furthermore, in the examples of Wehlage, et al. (Col. 14, lines 32-42) electroplating is performed only with zinc solutions.

Okuhama, et al. mention tin and zinc as two metals out of a large number of metals which additionally includes copper, silver, gold, cadmium, indium, germanium, lead, arsenic, antimony, bismuth, chromium, molybdenum, manganese, iron, cobalt, nickel, ruthenium, rhodium, palladium, osmium, iridium and platinum. A tin-zinc alloy is not explicitly mentioned. Furthermore, the examples of Okuhama, et al. do not use tin-zinc alloys.

Applicants submit that a person skilled in the field of electroplating of metals and metal alloys knows that additives that are advantageous in a certain plating bath for depositing a specific metal or metal alloy usually do not show the same advantageous effect in a bath for depositing a different metal or metal alloy. Moreover, negative effects may result by using an additive, favorably influencing the deposition of a specific metal or metal alloy, in another plating bath. In general, simple transfer of an electroplating bath composition suitable for one metal or metal alloy to a different metal or metal alloy does not give the desired result. Electroplating baths that differ only slightly regarding the metals contained therein can result in coatings of significantly different quality even if the same additives are used.

Therefore, a person skilled in the art would not just take the composition of an electroplating bath known to suitable for depositing a specific metal or metal alloy and change only the metal and metal alloy to be plated. In particular, a person skilled in the art would not conclude from the suitability of certain additives in a plating bath for

depositing specific metal or metal alloys that these additives cause an identical effect in another electroplating bath.

Applicants further submit that the data previously presented establishes that the use of the inventive plating bath containing both anionic and non-ionic surfactants provides a regular, fine crystalline, satin finished coating over the entire density range whereas prior art baths containing only one type of surfactant does not provide such a superior coating.

According to the disclosures of Wehlage, et al. and Okuhama, et al., different surfactants are mentioned and it is said that they are used singly or in combination. However, the importance of the specific combination of a non-ionic surfactant and an anionic surfactant on the quality of the plating (faults and discoloration) is not mentioned in any of the documents cited in the present Office Action.

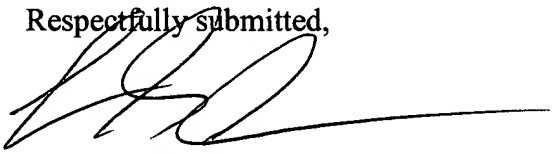
As stated above, Okuhama, et al. mention a large number of metals that can possibly be used. A combination of zinc and tin is not mentioned. In particular, Okuhama, et al. do not disclose a process of depositing a tin-zinc alloy. The examples only describe the deposition of a tin-copper or tin-silver alloy from highly acidic solutions (the amount of methanesulfonic acid mentioned corresponds to a pH of 0). The deposition of tin-zinc alloys from such highly acid solutions is, however, impossible.

Concerning Meyer, et al., applicants observe that this applied reference relates to the coloring of anodized aluminum surfaces. The coloring represents an anodic reaction which is not comparable with a cathodic deposition for which the presently claimed electroplating bath is used.

Based on the above remarks and data provided in the PCT International Preliminary Examination Report, applicants respectfully submit that the various § 103 rejections have been obviated. Reconsideration and withdrawal of the obviousness rejections raised in the present Office Action is thus respectfully requested. If the Examiner requests that the data provided in the PCT Preliminary Examination Report be present in the form a 132 Declaration, applicants hereby request that the Examiner telephone the undersigned to discuss the same prior to issuing any further Office Action.

Wherefore reconsideration and allowance of the claims of the present application are respectfully requested.

Respectfully submitted,



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LSS/sf
Enclosures International Preliminary Examination Report
Letter dated February 6, 2001

Translation

10

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 80 250 a/se	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/EP99/08724	International filing date (*day/month/year*) 12 November 1999 (12.11.99)	Priority date (*day/month/year*) 12 November 1998 (12.11.98)
International Patent Classification (IPC) or national classification and IPC C25D 3/60		
Applicant DR.-ING. MAX SCHLÖTTER GMBH & CO. KG		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
08 June 2000 (08.06.00)	01 March 2001 (01.03.2001)
Name and mailing address of the IPEA/EP Facsimile No.	Authorized officer Telephone No.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/EP99/08724

I. Basis of the report

1. This report has been drawn on the basis of (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

☒ the international application as originally filed.

☒ the description, pages 1-9, as originally filed,
pages _____, filed with the demand,
pages _____, filed with the letter of _____,
pages _____, filed with the letter of _____.

☒ the claims, Nos. 1-15, as originally filed,
Nos. _____, as amended under Article 19,
Nos. _____, filed with the demand,
Nos. _____, filed with the letter of _____,
Nos. _____, filed with the letter of _____.

☐ the drawings, sheets/fig _____, as originally filed,
sheets/fig _____, filed with the demand,
sheets/fig _____, filed with the letter of _____,
sheets/fig _____, filed with the letter of _____.

2. The amendments have resulted in the cancellation of:

☐ the description, pages _____
☐ the claims, Nos. _____
☐ the drawings, sheets/fig _____

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

4. Additional observations, if necessary:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

Int(ional application No.
PCT/EP 99/08724

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-15	YES
	Claims		NO
Inventive step (IS)	Claims	1-15	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-15	YES
	Claims		NO

2. Citations and explanations

1. This report makes reference to the following documents:

D1 EP-A-0 663 460 (DIPSOL CHEM) 19 July 1995 (1995-07-19)

D2 US-A-4 184 928 (HOIJE HUGO) 22 January 1980 (1980-01-22)

D3 US-A-4 168 223 (IGARASHI SHUJI ET AL) 18 September 1979 (1979-09-18)

D4 GB-A-2 266 894 (ZINEX CORP) 17 November 1993 (1993-11-17)

D5 PATENT ABSTRACTS OF JAPAN vol. 1998, no. 11, 30 September 1998 (1998-09-30) & JP-A-10 168592 (DAIWO KASEI KENKYUSHO:KK; ISHIHARA CHEM CO LTD), 23 June 1998 (1998-06-23).

2. D1 to D5 are considered to be the prior art closest to the subject matter of Claims 1 to 15. They disclose aqueous solutions which contain Sn(II)- and Zn(II) ions and aliphatic carboxylic acids.

The subjects of the claims therefore differ from these known aqueous solutions in that they contain anionic surfactants and non-ionogenic surfactants.

The subject matter of Claims 1 to 15 is therefore novel (PCT Article 33(2)).

3. However, the solution proposed in Claim 1 of the present application can be considered inventive for the following reasons (PCT Article 33(3)):

The problem to be solved by the present invention, namely that of stabilising the aqueous solution containing the Sn(II)- and Zn(II) ions, aliphatic carboxylic acids and/or their alkali salts over wide ranges of, for example, temperature, concentrations and pH, appears to be already disclosed in D1 to D5.

The description does not suggest that the aqueous solution of Sn(II)- and Zn(II) ions, aliphatic carboxylic acids are not stable over wide ranges of parameters. The problem to be solved by the present invention can therefore be considered to be to provide grain-refining means. However, the anionic surfactants and non-ionic surfactants are known to a person skilled in the art as grain-refining means (see D1, page 8, line 16; D2, column 2, line 8; D3, Examples 3, 4, 6, 7, 12, 17, 18, 23, 24, 26; D4, claims; D5, formula III).

The comparative tests filed with the letter of 6 February 2001 demonstrate that the addition to the basic electrolyte of only one anionic **or** a non-ionic surfactant to form a dark grey and coarse crystal coating, which has dendrite in a high surface density area, or produces a dark grey, fine crystal, uneven coating. However, the simultaneous addition of an anionic **and** a non-ionogenic surfactant

produces a homogeneous, fine crystal, satin coating over the entire surface density area. Consequently, Claims 1 to 13 involve an inventive step.

3.1 Dependent Claims 2 to 13 and 15 contain features which, combined with the features of any claim to which they refer, meet the PCT requirements concerning inventive step.

HOFFMANN · EITLE
Patent Attorneys and Attorneys-at-Law

Translation of the Writ as submitted to the European Patent Office February 6, 2001

H · E File: 80 250 / AHE/aol

International Application PCT/EP99/08724
DR.ING. MAX SCHLÖTTER GMBH & CO. KG

In response to the Communication of November 6, 2000:

1. Inventive Merit

The following is set forth in response to the objections raised in the Communication of lack of inventive merit of the aqueous solution claimed in the present application for the electrolytic deposition of tin-zinc alloys.

The present application is based on the object to provide an electro-plating bath solution for the deposition of tin-zinc alloys, the bath management of which is not critical over wide ranges of freely selectable parameters and permits depositions free of faults and discoloration (page 2, 4th paragraph of the present description).

This object is solved according to claim 1 by an acqueous solution, comprising the following components:

a) Zn(II) ions;
b) Sn(II) ions;
c) aliphatic carboxylic acids and/or alkali salts thereof;
d) anionic surfactants;
e) non-ionic surfactants.

As has been established in the Communication, the claimed solution differs from the electrolytic solutions of the cited prior art D1 to D5 in that in addition to the Zn(II) ions,

Sn(II) ions and aliphatic carboxylic acids (and/or salts thereof), anionic surfactants and non-ionic surfactants are used in combination.

It will be demonstrated below that aqueous solutions containing only Zn(II) and Sn(II) ions as well as aliphatic carboxylic acids, however, not anionic and non-ionic surfactants, cause instable, non-adhesive coatings. Moreover, it will be shown that electrolytic solutions containing alongside the cited components either anionic or non-ionic surfactants do not supply satisfactory coatings either. The object on which the present application is based is therefore not already solved by the electrolytic solutions described in the prior art.

The following comparative tests 1 to 4 were performed. The same basic electrolytes were used for all of the tests which contain the following compounds:

Citric acid	100g/l
NH_4Cl	50g/l
NH_4OH, 25 %	90g/l
H_3BO_3	30g/l
Sn^{2+} as $Sn(CH_3SO_3)_2$	3g/l
$ZnCl_2$	33g/l

The coatings were applied under the following deposition conditions:

Working temperature	40°C
Cathodic Current Density	1 A/dm²
Deposition Time	20 min

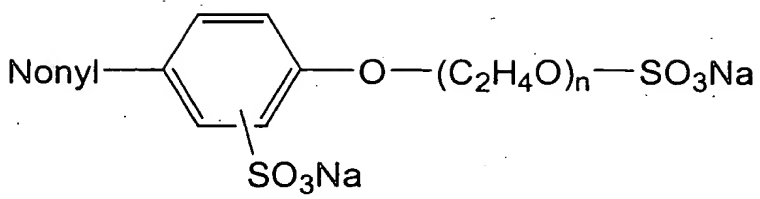
Test 1

Neither non-ionic nor anionic surfactants were added to the basic electrolyte.

Coating result: dark grey, irregular, dendritic and non-adhesive coating

Test 2

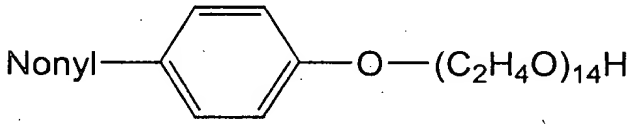
An anionic surfactant was added to the basic electrolyte. The following compound was used as anionic surfactant in an amount of 4g/l:



Coating result: dark grey and coarse crystalline coating having dendrites in the high current density range.

Test 3

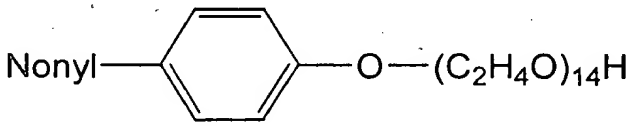
2 g/l of a non-ionic surfactant of the following formula was added to the basic electrolyte:



Coating results: dark grey and fine crystalline irregular coating.

Test 4

A mixture of a non-ionic and an anionic surfactant was added to the basic electrolyte. As non-ionic surfactant 2 g/l nonylphenol-ethoxilate of the following formula



and as anionic surfactant 5 g/l of the potassium salt of lauryl ethoxilate-ω-3-propane sulfonic acid of the formula

$C_{12}H_{25}$-O-$(C_2H_4O)_n$-$C_3H_6SO_3K$

were used.

Coating result: regular, fine crystalline, satin-finished coating over the entire current density region

In summary, the above results of the comparative tests as performed show that the object of the present application is solved by the aqueous solution according to the present claim 1, but not, however, by the solutions of the prior art. The solutions of the prior art result in non-adhesive, dendritic and/or irregular coatings. The use of the aqueous solution according to the invention results on the other hand in an excellently adhesive, fine crystalline (dendritic-free) and regular coating over the entire current density range.

The assertion made in the Communication that the object to be solved by the present invention consists only in providing grain refining means is not justified.

It cannot be derived in an obvious manner from cited prior art that the use of anionic and non-ionic surfactants in an acqueous solution containing Zn(II) ions, Sn(II) ions and aliphatic carboxylic acids (and/or the salts thereof) results in advantageous coatings also in the ranges of higher current density. Thus, the subject matter of present claim 1 is based on inventive merit over D1 to D5.

2. Clarity pursuant to Article 6 PCT

As regards the formulation of claim 15, it is noted here that this claim is a typical use claim. It differs from the independent claim 14, about which no objections were made, only in that the zinc proportion in the tin-zinc coating is specified. A detailed characterization of the purpose of use cannot, however, provide clarity as regards the subject matter to be protected. Moreover, it is also known to the person skilled in the art that he can obtain an alloy with 10 to 50 wt.% zinc by correspondingly selecting the zinc and tin salt concentrations. Thus, the objection made in item 4 of the Communication is not justified.

3. Conclusions

In summary, it is requested that the inventive merit of the subject matter presently claimed as well as the clarity of the claims be recognized in the International Preliminary Examination Report, taking into consideration that stated above and in particular the results of the comparative tests as submitted.

Dr. Matthias Kindler
European Patent Attorney
Association No. 151